

Enabling Pump Technologies for Deep Throttle Ascent/Descent Engine Operation, Phase I

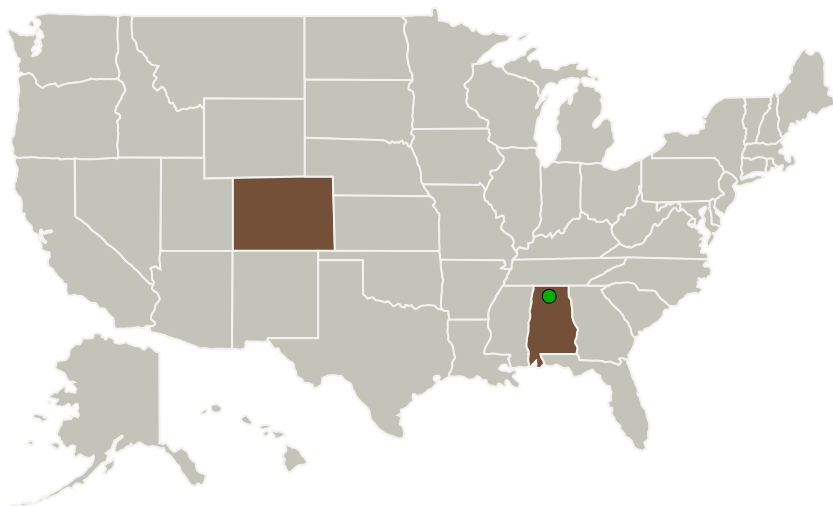
Completed Technology Project (2015 - 2015)



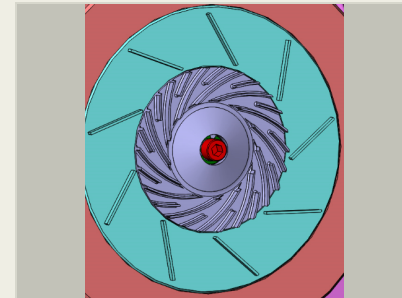
Project Introduction

Methane fueled ascent / descent space engines in the 10,000 to 25,000 lbf thrust class require deep throttle capability, placing unique challenges on the turbopumps. Previous engine throttle-ability studies have required both LOX and fuel turbopumps to operate at ratios of volumetric flow rate to shaft speed (Q/N) of 0.2 to over 1 for 10:1 engine throttle operation. Such operational ranges are particularly difficult for pump axial inducers and vaned radial diffusers. Both are prone to fluid separation and stall at low Q/N operation and excessive passage blockage due to cavitation at high Q/N values. The proposed innovation combines two separate technologies to address the inherent design shortcomings of the inducer and diffuser under operation at both low and high Q/N extremes.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Barber-Nichols, Inc.	Lead Organization	Industry	Arvada, Colorado
 Marshall Space Flight Center (MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama



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Primary U.S. Work Locations

Alabama

Colorado

Project Transitions

June 2015: Project Start

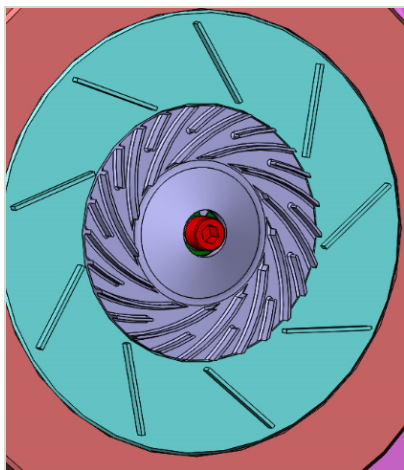
December 2015: Closed out

Closeout Summary: Enabling Pump Technologies for Deep Throttle Ascent/Descent Engine Operation, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/138976>)

Images



Briefing Chart Image

Enabling Pump Technologies for Deep Throttle Ascent/Descent Engine Operation, Phase I
(<https://techport.nasa.gov/image/128929>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Barber-Nichols, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

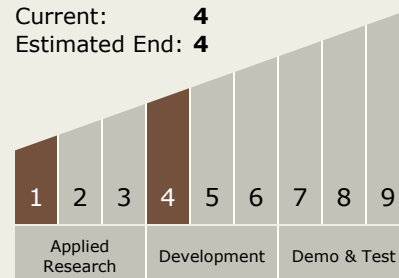
Carlos Torrez

Principal Investigator:

Scott R Sargent

Technology Maturity (TRL)

Start: **1**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.3 Cryogenic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System